THE GEOMORPHOLOGICAL VALUE OF DOLOMITE SURFACES IN THE BALATON-UPLAND NATIONAL PARK, HUNGARY

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Summary
The environmental sensitivity of karstic areas is well known. These areas could be important from environmental protection considerations and the value of the karstic landscape could be increased by its typical geological and geomorphological formations, by its flora and fauna. In Hungary the limestone areas have received considerable attention but the other karstic rock, dolomite, is less well studied. The dolomite areas possess the above-mentioned features, but show significant differences from limestone karstic areas due to the different mineral composition of the rock. The typical erosional processes on dolomite surfaces are not sufficiently well known but this knowledge is indispensable to environmental evaluation of these areas.

Geological situation

In the Balaton-Upland region, besides the Triassic dolomite, one can find limestone and non - carbonate rocks on the surface. Three main tectonic lines meet here, therefore, the tectonic structure of the area is complex, signed by preformed shallow valleys and large depressions (*Fig. 1*). The first scientist, who wrote a genetical analysis about this area, was Jenő Cholnoky, one of the best-known Hungarian geomorphologist of the first part of the 20th century. He explained these valleys and depressions as deflational landforms (1938). According to Márton Pécsi, periglacial climate caused the formation of dolomite's rubble and powder. In his opinion derasional valleys and their systems construct the surface.

Jakucs (1971) said, that dolomite rubbles are the result of karst solution. According to this theory the dolomite falls apart because it consists soluble carbonate minerals too. We think that all these processes have influenced the formation of the landforms, so it is the object of further investigation to determinate which process had bigger importance on the studied dolomite area.

Morphology

The primary surface of the Balaton-upland is divided into residual areas by swallow valleys and depressions. The tops of residual areas are in the same altitude. Residual areas, valleys and depressions are the macroforms of the landscape. The macroforms are divided by minor forms (e.g. monadnocks, dolines, deflated soilness marks). Their diameter ranges from few millimetres to several meters. On several places they appear as single forms, but usually they occur in groups. The most important factors of

denudation are the following: The dislocations and joints are very important, as they preform and divide the area. The surfaces, which are broken by tectonic lines, separated into ridges by valleys. Wider plateaus exist between the valleys, which were formed not too close to each other. On the steeper slopes secondary valleys were formed, which divide surface into smaller parts. This is the formation of cons (monadnocks). On the less steep surfaces dolines and other depressions (such as the bottom of valley on a plateau and some ridges) occur. Any part of a valley and any depression could be transformed into the great depression system with varied layout. The area of the higher (residual) areas is decreasing, because the lateral growth of the lower areas. All the forms covered by shallow, lithomorphic soil with typical vegetation, with the exception of the deflated ones. Under the soil one can find autochthonous dolomite rubble layers in various depths. These layers are usually deeper in the valleys and depressions. We think that the depth of this autochthonous dolomite rubble cover is in connection with the intensive karstification. The development of depressions (dolines and some valleys) is in a close connection with the karstification process.

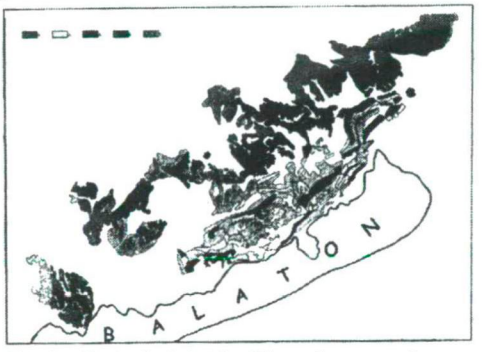

Fig. I. a Geological sketch of the carbonate-rock areas
1.: Main Dolomite (Upper - Triassic), 2.: "Megyehegy" dolomite (Lower - Triassic), 3.: Dolomite with cellar structure (Lower - Triassic), 4.: Other carbonate assise with dolomite, 5.: Other carbonate assise without dolomite

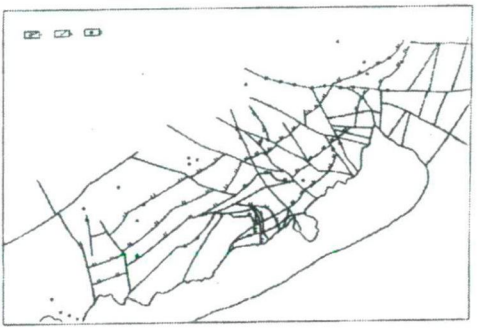

Fig. I. b Tectonic sketch of the Balaton-Upland area
1.: Upthrusts, 2.: Other dislocation faults, 3.: Dolomite-mines

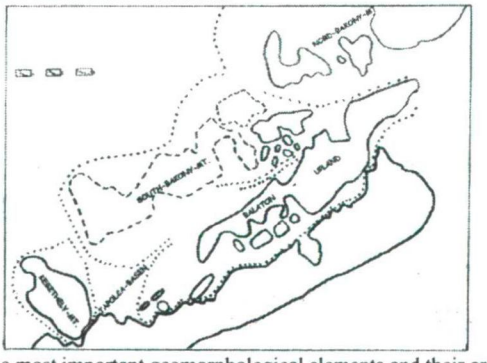

Fig. I. c The most important geomorphological elements and their areal extent
1.: Tabular faulted mountains, 2.: Exhumed peneplane, 3.: Front of the Pediment

The microforms on dolomite are especially important. The karren forms on dolomite are smaller than on limestone rocks. They have little significance in aspect of surface forms. The following locally characteristic forms can be found on the studied surfaces: micropits, kamenitzas. Fracture-controlled linear forms are microfissures, splitkarren, grikes, cutters and karren caverns.Hydrodynamically-controlled linear forms can't be find because especially the heads of the layers have been uncovered, therefore, the extension of dolomite surfaces is relatively small. Some embrional forms can be seen on the area, formed by mixture corrosion or other solution processes on several sites, where dolomite outcrops.

Some aspects of landscape protection

In the Balaton-upland area, which was declared as a National Park recently, the following dolomite areas protected because of their significant natural values: Kis-Bakony Hill, Babuka Hill, Várhegy Hill, near the settlement of Hegyesd, Dolomite hills in the Pécsely-basin, Dolomite hills near Balatonfüred, Dolomite hills near Balatonalmádi and the Vilonya-plateau. Besides their typical forms, these territories represent important botanical values: the different vegetation types show very mosaic pattern and they are rich in species, therefore, they recorded as such a ecosystem that deserves the highest degree of protection by the World Strategy for Environmental Protection. The human pressure on the area is ambivalent. As the dolomite surfaces are less useful, the significant human effects arise just in some points, therefore, natural areas could maintain in significal extension.

The most harmful human activities are: overgrazing; plantation of non-native forests (Pinus nigra stands); stone mining and the usage of mine pits as rubbish dumps; besides the degradation of soil and vegetation on shooting-ranges and military-grounds, these areas are contaminated by special rubbish and pollutant materials; -unfortunately, in the neighbourhood of the popular visitor sites the rubbish catering is not satisfactory and the tourists eager to pick up protected flowers as well.

The Balaton-Uplands National Park

The Balaton-Uplands National Park was established in 1997 in the richest region in terms of culture, scenery and history of Hungary. It extends over 56 000 hectares. The natural and cultural values of the landscape can be protected successfully through large-scale zone division, i.e. having on a protected area a stepped structure and taking into consideration the interests of inhabitants, farmers and holidaymakers. There are three zones within the Balaton-Uplands National Park:

1. Zone I.: Core area (strictly protected area). An area which has retained its original condition protecting major natural values, untouched and to be visited freely via designated paths, though occasionally with permission only, with no farming.
2. Zone II.: Managed natural zone. Hardly disturbed area, close to its natural condition, requiring natural management methods, to be visited freely.

3. Zone III.: Tourist or buffer zone. The outer protection belt encompassing the settlements within the National Park, the vine hills, the mass tourism sites, the places exhibiting the values and offering repose to hikers (*Fig. 2*).

It can be stated that there is no perfect resolution for the protection of the dolomite's special geomorphological values of this National Park. In some cases the frontiers of the National Park were designated valuable geomorphological areas, not managed as a unit, and the protection is extended just over part of them. On the non-protected areas, we noticed numerous harmful effects that basically influences naturalness.

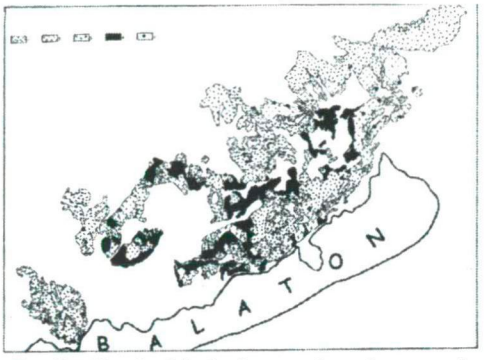

Fig. II. a Sketch of the land-use on the carbonate-rock areas
1.: Forests, 2.: Grass-land (pasture, common or gun-range), 3.: Vine-culture, 4.: Arable, 5.: Dolomite-mines

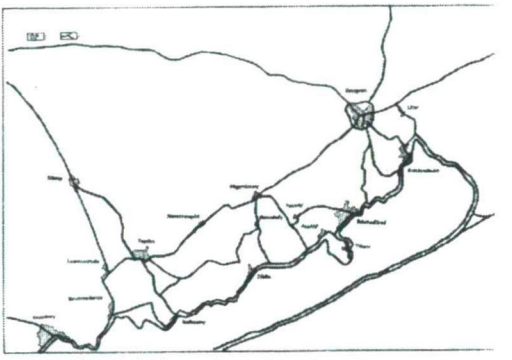

Fig. II. b The main roads and settlements
1.: Roads, 2.: Settlement

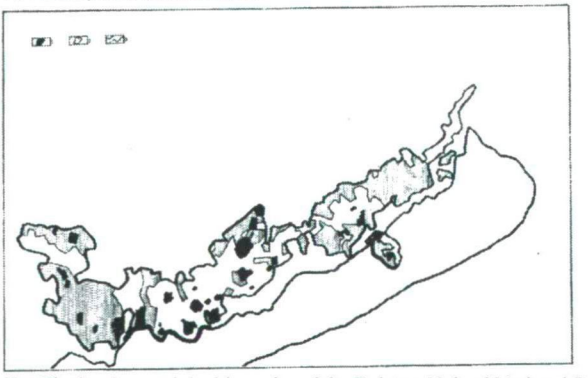

Fig. II. c The borders and the hierarchy of the Balaton-Upland National Park
1.: Core-area, 2.: Managed natural zone, 3.: Buffer zone

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